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EXECUTIVE SUMMARY

This first volume of the Accreditation Support Package (ASP-I) is designed to provide a potential user with a characterization of the current status of the TRajectory Analysis Program (TRAP) Version 3.1a with respect to criteria related to its general acceptability for use. The information presented in this volume should characterize the model well enough to provide an initial determination of its suitability for a particular application. It should also provide confidence that the model is well enough managed and supported to yield consistent results across its spectrum of users and applications. The information provided to characterize the subject model consists of the following elements.

   a.   A description of the configuration management baseline for the model, including version history, current version status, model development policy (including beta site provisions), documentation availability, and a summary of configuration management policies, procedures, guidelines and support functions in place for the model;

   b.   A summary of implicit and explicit assumptions and limitations inherent in the model because of its design and/or coding assumptions or structure, as well as any implied constraints to the use of the model that are a consequence of these assumptions or structures. A listing of known errors or anomalies found as a result of prior V&V efforts is also included;

   c.   A review of the model's development, verification and validation (V&V) and usage histories, as well as a summary of prior accreditations;

   d.   A review of the status of model documentation and its conformity to accepted software documentation standards, as well a review of documentation with respect to verification requirements, and;

   e.   A summary of overall software quality as characterized by conformance to accepted design and coding practices.

ASP-I provides the details of these information elements in a single document. The degree to which each information element is complete and current provides a general indication of whether the model is suitable for further consideration for use in a particular application.

Each of these elements is described in detail in this report, and is summarized as follows:

Configuration Management Baseline

This volume pertains to TRAP Version 3.1a. Version 4.0 will be released sometime in 1998, and is anticipated to correct many of the deficiencies identified in the current version.

Configuration management is through the TRAP Development Council (TDC), a National Air Intelligence Center (NAIC) Aerodynamic Weapons Design Branch in-house group chaired by the Branch Chief and Model Manager. TRAP is a threat analysis support tool, and there is presently no requirement, obligation, nor funding to respond to other than in-house and intelligence community configuration management problems. There are no documented CM guidelines, and priorities for code changes are dictated by the Intelligence Community's requirements. There are no Model Deficiency Reports (MDR) produced by NAIC. Survivability/Vulnerability Information Analysis Center (SURVIAC), who

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maintains the TRAP core simulation in their Joint Technical Coordinating Group on Aircraft Survivability (JTCG/AS) library of codes, does not provide configuration control, does not maintain MDR files, and routinely forwards requests for technical assistance to the modelers in NAIC/TANW due to lack of resources for upgrades. Users' conferences, held infrequently, are the main forum for interchange of information between the intelligence and other user communities. Section 2 addresses configuration management of TRAP.

Summary of Assumptions, Limitations, and Errors

It is vital that the intended use of the simulation is fully understood so that it is not applied to solve a class of problems for which it is entirely unsuited. Development of TRAP has been in response to the need to assess the performance of missile system aerodynamics. The level of fidelity in the various parts of the simulation is only intended to be sufficient to obtain the correct airframe response of the missile while it is intercepting a representative target in a benign environment. The simulation is designed to err towards the worst case to represent the most capable threat system. It incorporates different levels of fidelity such that an appropriate level can be chosen to match either the quality of the available data (e.g., point-mass aerodynamics compared to 6-degree-of-freedom (DOF) aerodynamics), or the intended use of the simulation (multiple zones to generate maximum missile launch ranges compared with detailed modeling of a single engagement geometry). Generally, if run in a lower fidelity mode, there will be a greater number of assumptions in the simulation and outputs must be used accordingly. Some apparent limitations exist because there has not yet been a need to model a particular feature. Some parts of the simulation may be in error because a feature has been incorporated but has never been used or extensively tested (for instance, some of the guidance and autopilot options). When TRAP is used in a production mode (using a previously developed and tested model), the effect of these assumptions and limitations has been taken into account, and the simulation should provide acceptable results provided it is operated within the constraints specified by the developer. Assumptions, limitations, and errors should be of prime concern to the model developer who may wish to use some of the generic features in TRAP. Section 3 summarizes model assumptions, limitation, and known errors by functional element (FE).

V&V Status and Usage History

The Air Force Intelligence Support Agency (AFISA) performed a limited V&V of the TRAP Version 3.0 library code in 1991. This study is one of the few documented V&V efforts available. The intelligence community's perception on Verification, Validation, and Accreditation (VV&A) of an Intelligence Model is presented in a white paper in Appendix D. V&V of the digital threat models that compose the TRAP simulation is an internal activity at NAIC that is performed as the code is corrected, upgraded, or new capabilities are added. These actions are summarized in various tables in Section 4 of this report. Unfortunately, much of the documentation related to these activities is unavailable due to security restrictions. TRAP users have generated very little available documentation of their mostly proprietary efforts. Their use of the simulation is also outlined in Section 4.

Over 60 users, composed of government agencies and contractors, are on the current SURVIAC users list. Additional users identified bring the current total to over 140. A comprehensive list of known users is provided in Appendix B. The Air-to-Air Missile (AAM) Working Group, whose mission is to develop and maintain a common model repository of AAM flyout models, decided that NAIC's TRAP simulation, with its close

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association to the intelligence community, was an excellent candidate as the baseline model for use in real-time Electronic Combat Hardware-in-the-Loop facilities, constructive simulations, and on Open Air Ranges supporting the Operational Test and Evaluation (OT&E) community. This recommendation was approved by AFDOT&E in March 1995.

Documentation Assessment

The quality of the TRAP documentation is assessed to be good for the information included. While extensive reformatting will be needed to achieve standardization, which might be of benefit to a potential user, the current format should not impact V&V activities for the information included. The inclusion of some missing material, however, would be instrumental in the verification process (e.g., a comprehensive list of assumptions and limitations, justification for equations and algorithms used, and documented sources for algorithms used). This information is also of importance to the user in determining whether the model is applicable to the problem at hand. The execution instructions in the User's Manual are not sufficient for the inexperienced user, and there are no separate Analyst's or Programmer's Manuals, although much of the required information is included in the User's Manual. The installation information is minimal and does not address all of the platforms in use and there is little discussion of error messages and diagnostics which would be useful to both the user and programmer. A complete documentation assessment report is included in Section 5.

Software Quality Assessment

The TRAP 3.1a source code was written in conformance with accepted standards, should be understandable by missile performance analysts dedicated to working with TRAP, and is modular enough to allow users to configure it for their specific scenarios. There is, however, significant room for improvement in the areas of variable definition, variables declared but not used, and error handling (specifically, the lack of messages to the user about specific errors). A complete assessment is included in Section 6.

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